NASA TECH BRIEF
Goddard Space Flight Center

GREMEX Update (Goddard Research Engineering Management Exercise)

The problem:

The explosive growth of science and technology has created a seemingly overwhelming paradox: the effective management of vast manpower and dollar budgets allocated to programs whose goals are well defined, but whose achievement requires a course of action evolved from many alternatives.

. In today's space and defense project-oriented research and development where scientific needs and technological development must be blended and matched against the harsh realities of available manpower, funds, and time schedules, the problem is particularly acute.

The solution:

In an effort to meet these shortcomings, management simulation techniques are being employed to offer training in management problems. GREMEX was developed to provide experience in Research and Development (R&D) project decision making from a management rather than a technological perspective.

How it's done:

GREMEX is a man-machine management simulation game of the life of an R&D project. It depicts the mythical project from just after the development of the project plan through the construction phase. The game is computer based to the extent that a computer is used to calculate (simulate) the effects of management actions and contractor performance.

GREMEX is not new in that it has previously had wide distribution, but the program and documentation have been revised innumerable times in the past. This report is for the revised version as it exists to date.

The basic action of the GREMEX program is to simulate one month of project work for each computer input or play. The project itself is described in terms of a PERT network and is originally established by data cards at the start of the game. The numerical reactions of the model are related to typical R&D projects and the PERT data cards include probabilities of meeting the time, cost, and performance goals. Provisions for student inputs (decisions) to change these values are provided.

The computer program itself must be supported by other paper simulation data such as project plan or contractor evaluation and selection documents. This simulation may be adjusted for the teaching intent or needs of the group by change in emphasis on the various areas of the project.

The general purpose GREMEX program handles a project that consists of one to fifteen contracts. Any sort of system may be represented by the program provided that it consists of a connected sequence of events that can be described in a flow chart.

The program will accept any project that consists of less than 1000 events. A smaller memory computer could be utilized by reducing the number of events and redefining certain dimension statements through the routines.

Initially, the players are presented with the project with the understanding that no ground rules exist: however, NASA policy should be their guide. They are permitted to do almost anything and the model will react as it would in real life. To each player or team of players there is assigned a referee-instructor who serves as the interface between the players and the computer program. He converts the players' decisions to a form that will be acceptable to the model.

The "Design Manual for GREMEX Simulation" is written around the IBM-360 version; however, a memo is included in the IBM-7094 documentation that lists the major differences between the IBM-360 and the IBM-7094 versions. The principal difference between the two versions is a result of packing several items of data into each 7094 word in COMMON files to save core. As a result, a number of additional machine language subroutines are required to store or retrieve the items.

Notes:

1. This program consists of two versions:
   Version 1 – programmed in FORTRAN IV (93%) and MAP (7%) for the IBM-360 computer.
   Reference: GSC-11512

   Version 2 – programmed in FORTRAN IV (61%) and MAP (39%) for the IBM-7094 computer.
   Reference: GSC-11515

2. Inquiries concerning this program should be directed to:

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   Reference: GSC-11512-15

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